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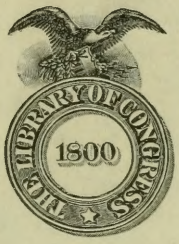

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No. 27

Contribution from the Bureau of Chemistry, Carl L. Alsberg, Chief.
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BOUILLON CUBES: THEIR CONTENTS AND FOOD VALUE COMPARED WITH MEAT EXTRACTS AND HOME-MADE PREPARATIONS OF MEAT.

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INTRODUCTION.

As the true dietary value of commercial meat preparations, especially bouillon cubes, fluid and semisolid meat extracts, commercially bottled meat juices, and similar preparations offered for sale, is not generally understood by the people, and as these articles are erroneously believed to be convenient forms of concentrated meat, the Bureau of Chemistry has undertaken to determine their actual food value. Complete analyses have been made of ten of the leading brands of bouillon cubes manufactured in the United States and Germany, and collected on the New York market in 1912. One purpose of this investigation was to determine whether the term "bouillon," which is defined as a broth prepared from meat, may justly be used for many of these cubes which, while not nutritious, have a certain value as a flavoring medium and as a stimulating and appetizing drink.

Bouillon cubes as sold by most grocers are wrapped in tin foil, paraffin paper, or both. They will keep indefinitely, although certain makes are likely to lose their form during warm weather.

COMMERCIAL BOUILLON CUBES.

The results of the analyses of these cubes are expressed in the accompanying tables and diagrams in common terms, as salt, water, fat, plant extract, and meat extract. It will be observed that common salt is the greatest constituent, being from 49 to 72 per cent of the total weight of the cubes. The amount of meat extract present ranges from 8 per cent in the poorest brands to but 28 per cent in the best brands. The third important ingredient is plant or vegetable extract which constitutes from 3 to 30 per cent. This plant extract is useful because of its flavoring properties but has but slight, if any, nutritive value. The amount of meat stock or meat extract

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in the poorer cubes is small and the amount of salt and plant extract large.

Table I makes it very clear that none of these cubes is a concentrated beef juice or essence. The dietary value, as is apparent from the table and from the figures, 1, 2, and 9 (p. 6), lies largely in the fact that they act as a stimulant. As they also contain a small amount of protein (muscle-building substances) in the meat extract, they may be said to possess slight nutritive value. Most of these cubes have no advertised claim to be concentrated beef broth or essence. Many people, however, believe them to be highly concentrated meat and therefore to possess a high nutritive value, especially for invalids, but this is not true.

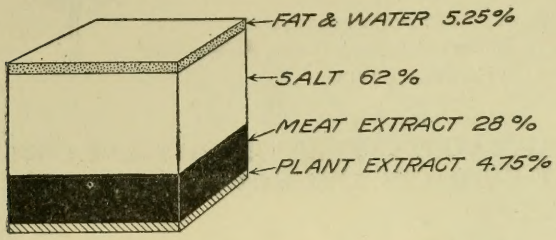

FIG. 1.—Best grade bouillon cube (25 cents a dozen).

As the meat extract is the element which provides any nutritive value these cubes possess, it is apparent that the cubes numbered 1 to 5 have slightly greater nutritive value than the cubes numbered 6 to 10, the latter being made largely from plant extract, salt, and flavoring substances.

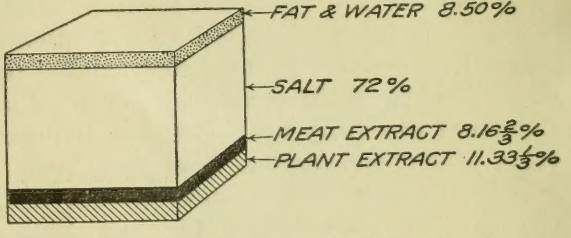

FIG. 2.—Poorest grade bouillon cube (15 cents a dozen).

TABLE I.—*The composition of commercial bouillon cubes.*

Cube No.[1]	Source of manufacture.	Salt.	Water and fat.	Approximate amount of meat extract present.	Approximate amount of plant extract present.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
1	United States	62	5.25	28	4.75
2	Germany	65	9	23	3
3	United States	65	8	18	9
4	.....do	67.5	5	17.8	9.7
5	.....do	59.2	7	17.8	16
6	.....do	49.25	5.75	15.33	29.66
7	.....do	53	4.1	14.6	28.3
8	Germany	72	5.5	14	8.5
9	United States	72.5	8.5	8.33	10.92
10	.....do	72	8.5	8.17	11.33

[1] Cubes arranged in table in order of content of meat extract.

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COMPARISON OF NUTRITIVE VALUE AND COST OF BOUILLON CUBES WITH SEMISOLID MEAT EXTRACT, FLUID MEAT EXTRACT, AND COMMERCIAL MEAT JUICE.

SEMISOLID MEAT EXTRACT.

The ordinary meat extracts sold on the market in jars contain from 45 to 65 per cent of meat extract, 15 to 25 per cent of water, 5 to 20 per cent of salt, and 10 to 20 per cent of ash other than salt. The best meat extracts, therefore, contain more than twice as much meat extract as the best of the bouillon cubes, and one-tenth as much of the table salt. Bouillon cubes are commonly made from semisolid meat extracts by the addition of varying amounts of plant extracts, salt, and flavoring matter.

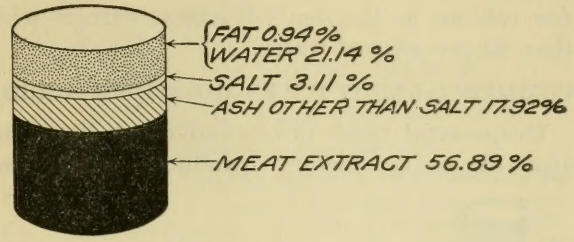

FIG. 3.—Best grade semisolid meat extract (45 cents for 2 ounces.)

The cost of semisolid meat extracts at retail is 45 cents for 2 ounces or more. The bouillon cubes on the market are sold at from 1 to 2 cents each and it takes from 15 to 20 cubes to weigh 2 ounces. This would make the cost of 2 ounces of bouillon cubes 25 to 40 cents. It is, therefore, apparent that the cubes which contain about two-thirds salt and never more than 28 per cent meat extract, are an expensive form of securing meat extract. The 45 cents, if spent for semisolid meat extracts, will purchase two to three times the amount of meat extract that it is possible to obtain for the same money in the form of bouillon cubes. Those wishing to make bouillon from the semisolid meat extract can do so at practically no additional cost by adding salt to the extract and water to suit their own taste, making a bouillon of greater value at a much smaller cost, which differs from the commercial bouillon prepared from cubes only in that it does not contain plant extract and does not have the special flavor characteristic of the cube. Bouillon prepared in this way possesses stimulating value equal to or greater

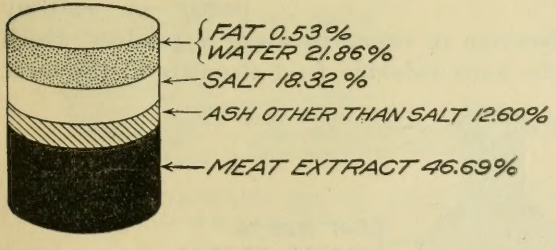

FIG. 4.—Poorest grade semisolid meat extract (53 cents for 4 ounces.)

than that prepared from the more expensive commercial cubes. As a flavoring agent the semisolid meat extracts are added to gravy and soup and are better than bouillon cubes because the soup, when prepared from vegetables, already contains the flavoring derived from the vegetables.

FLUID MEAT EXTRACT.

Fluid extracts of meat are a more expensive product than the semisolid meat extracts. Commercial fluid-meat extract consists of at least one-half water and is sold at about the same price, volume for volume, as the semisolid meat extract which contains not more than 25 per cent of water.

COMMERCIAL MEAT JUICES AND OTHER LIQUID MEAT PREPARATIONS.

Commercial meat juices and other liquid meat preparations are also expensive dietary products when the amounts of food actually present in them are considered. One reason for this is that in making these commercial juices the coagulable protein, or muscle-building food elements, which are pressed out of meat and are present in freshly made meat juice, are partly or entirely removed by the manufacturer in order to make a product which will keep. Therefore, the most valuable food elements of the meat juice usually do not reach the consumer. These commercial meat-juice preparations cost from 50 to 75 cents for 2 ounces of liquid, which makes them much more expensive than the semisolid meat extracts. These commercially prepared meat juices are frequently fluid extracts of meat—that is, dilute solutions of the semisolid meat extracts.

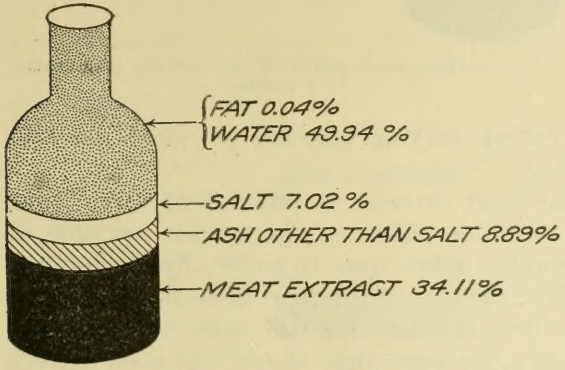

FIG. 5.—Best grade fluid meat extract (35 cents for 2 ounces).

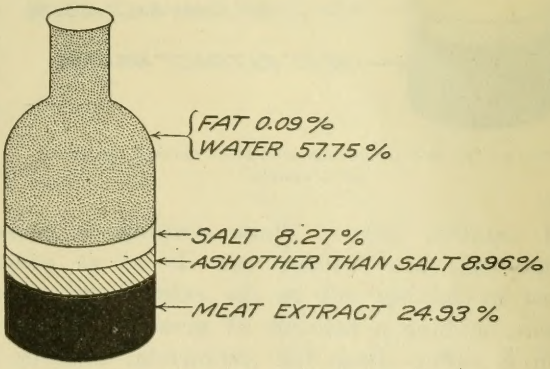

FIG. 6.—Poorest grade fluid meat extract (40 cents for 3½ ounces).

COMPARISON OF THE FOOD VALUE AND COST OF A HOMEMADE BEEF BROTH AND A HOMEMADE MEAT AND VEGETABLE SOUP WITH BOUILLON CUBES, SEMISOLID MEAT EXTRACTS, AND SIMILAR PREPARATIONS.

To determine how the cost of meat extract obtained in bouillon cubes, semisolid meat extracts, and other meat preparations compares with homemade beef broth, and meat and vegetable soup, the investigator prepared two kinds of homemade soup, keeping careful account of the actual cost.

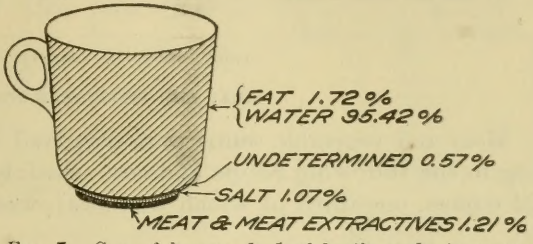

FIG. 7.—Cup of homemade beef broth ready to serve; prepared especially for children and invalids; more nutritious than the commercial preparations (4⅓ cents a cup).

BEEF BROTH.

Two half-pound portions of ground beef were bought for 13 cents each, or at the rate of 25 cents per pound, a high price for this meat. One pint of cold water was added to each lot. The mixtures were stirred and allowed to stand in the cold for 15 minutes. They were then placed on the stove and brought to a boil. A pinch of salt was added. The broth, which contained some of the smaller particles of the meat, amounted to 1 pint or 3 cups. The price, therefore, using expensive meat of this kind, would be about 4⅓ cents per cup. This cost, of course, could be greatly reduced by purchasing the meat at a lower-priced market, or using a less expensive cut. Analyses of the broth are given in Table II. In Table III it is seen that the amount of meat and extractives thus obtained, one-sixth of an ounce, for 10 cents, was as cheap as the meat extract in many of the commercial preparations. In addition, this broth contained all the fat of the meat which is a valuable food and which is eliminated from ordinary commercial meat extracts. The meat, after the soup is made, is available for the preparation of hash or other food and thus still further reduces the actual cost of the meat broth.

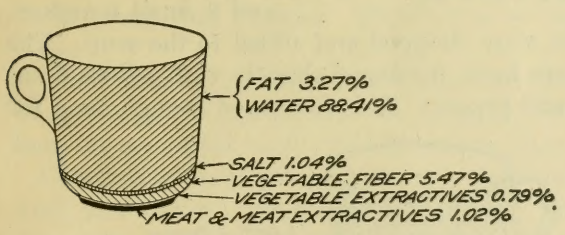

FIG. 8.—Cup of homemade meat and vegetable soup ready to serve; a cheap and nutritious food (1½ cents a cup).

TABLE II.—*Analyses of homemade meat preparations.*

Sample No.	Substance.	Water.	Fat.	Ash.	Salt.	Meat and meat extractives.	Vegetables and vegetable extractives.	Undetermined material.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*
1	Beef broth	95.44	1.72	1.45	1.07	1.21	.....	0.18
2	.....do	94.26	2.49	1.33	.93	1.63	.....	.29
3	Meat and vegetable soup	88.41	3.27	1.47	1.04	1.02	0.79	[1] 5.04
4	.....do	88.22	5.12	1.55	1.16	.94	.79	[1] 3.38

[1] Largely cellulose or vegetable fiber.

MEAT AND VEGETABLE SOUP.

Meat and vegetable soups were prepared in the laboratory according to the following recipe and cost schedule: A soup bone weighing 24 ounces, one-third of which was meat, was purchased for 10 cents. After being washed it was placed in a large kettle with 3 pints of cold water and was heated for three hours, when the bone and meat were removed. One-fourth of a small head of cabbage, 1 onion, 1 carrot, a large potato, and 2 small tomatoes, all costing about 5 cents, were chopped and added to the soup. The mixture was boiled for one hour, thickened slightly with a little flour, and seasoned with salt and pepper. This furnished enough soup for a family of five at a cost of approximately 16 cents, not counting fuel. This homemade soup, in addition to containing meat extractives, contained gelatin from the bone and some of the food elements in the vegetables. It also contained a large proportion of the fat of the meat and bone. Table II, which shows the composition of homemade meat broths and meat and vegetable soups when ready to serve, can not, of course, be compared directly with Table I, which shows the composition of commercial bouillon cubes before they are diluted with water for serving.

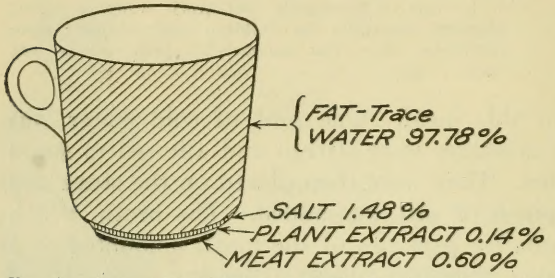

FIG. 9.—Cup of bouillon prepared by dissolving 1 cube in a cup of water; largely water and salt but has flavoring and stimulating value (1 to 2 cents a cup).

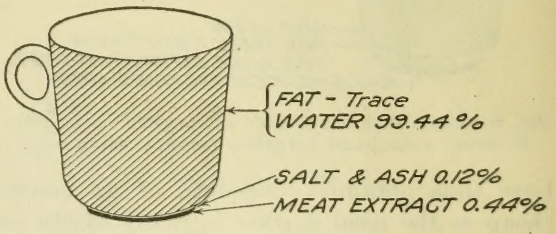

FIG. 10.—Cup of bouillon prepared by dissolving one-fourth to one-eighth of a teaspoonful (1.0 gram) of semisolid meat extract in a cup of water; largely water but has flavoring and stimulating value (1 cent a cup).

The relative cost of the commercial and homemade preparations of meat is shown in the following table:

TABLE III.—*Relative cost of commercial and homemade meat preparations.*

Sample No.	Substance.	Amount.	Cost.	Amount of meat extract obtained for 10 cents.
		Ounce.	*Cents.*	*Ounce.*
1	Best grade bouillon cubes	1	20	$\frac{1}{2}$
2	Poorest grade bouillon cubes	1	10	$\frac{1}{12}$
3	Best grade semisolid meat extract	1	23	$\frac{1}{4}$
4	Poorest grade semisolid meat extract	1	13	$\frac{1}{2}$
5	Best grade fluid meat extract	1	18	$\frac{1}{3}$
6	Poorest grade fluid meat extract	1	11.5	$\frac{1}{3}$
7	Commercial meat juice	1	25	$\frac{1}{10}$
8	....do	1	35	$\frac{1}{10}$
9	Homemade beef broth [1]	[2] 1	4.5	$\frac{1}{6}$
10	Homemade meat and vegetable soup [1]	[2] 1	1	$\frac{1}{2}$

[1] These two preparations are diluted and ready to serve. The others are all to be diluted with water before serving

[2] Cups.

SUMMARY.

One-half to three-fourths of bouillon cubes is table salt. The cubes are not concentrated beef or meat essence, as many people believe. They are valuable stimulants or flavoring agents, but have little or no real food value. Bouillon cubes, therefore, are relatively expensive.

Semisolid meat extracts sold in jars are not concentrated beef. They are stimulants and flavoring adjuncts and have only a slight food value, owing to a small amount of protein (muscle-building food) which they contain. They are more expensive than homemade soups.

Fluid meat extracts are dilute solutions of semisolid meat extracts. They are sold in bottles and are flavored. They are more expensive than the semisolid meat extracts because they contain more water.

Commercial meat juices are largely deprived of their most valuable food constituent—the coagulable protein, or muscle-building food. They are similar to fluid meat extracts, and some makes cost more.

Homemade meat broth is more nutritious and provides more meat extractives, protein, and fat at less expense than the commercial preparations.

Homemade meat and vegetable soup contains much more food and is therefore much cheaper than the bouillons or soups prepared from commercial cubes, extracts, or juices.

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